

Appl. No. 10/603,361
Reply to Office Action of 12/30/2005
Amdt. dated 03/23/2006

Attorney Docket No.: N1085-00089
TSMC 2002-0917

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

- 1 1. (Currently Amended) A method of making a multiple gate electrode on a
2 semiconductor device, comprising the steps of:
 - 3 coating a layer of gate electrode material over top and past the opposed sides of
4 a semiconductor device that has been previously coated with a thin film of gate
5 dielectric on the top and the opposed sides of the semiconductor device; and
 - 6 planarizing the layer of gate electrode material to produce a substantially planar
7 surface formed only of the gate electrode material disposed atop the semiconductor
8 device and extending that extends past each of the opposed sides, prior to patterning
9 the gate electrode material to form a discrete multiple gate electrode on the
10 semiconductor device.
- 1 2. (Original) The method of claim 1, further comprising the steps of:
 - 2 applying a photoresist mask of substantially uniform thickness on the planar top
3 surface of the planarized gate electrode material;
 - 4 patterning the photoresist mask to cover a corresponding pattern of the discrete
5 multiple gate electrode; and
 - 6 etching the gate electrode material that is uncovered by the photoresist mask to
7 form the discrete multiple gate electrode.
- 1 3. (Original) The method of Claim 1, further comprising the step of:
 - 2 conforming the layer of gate electrode material with a step height increase
3 corresponding to an increased step height of the semiconductor device.

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- 1 4. (Original) The method of claim 1, wherein the semiconductor device
2 comprises a silicon fin
- 1 5. (Original) The method of claim 1 wherein, the semiconductor device comprises a
2 fin of silicon and germanium.
- 1 6. (Original) The method of claim 1, further comprising the steps of:
- 2 applying a photoresist mask of substantially uniform thickness on the planar top
3 surface of the planarized gate electrode material, the mask comprising photoresist and
4 a mask material selected from the group comprising, silicon nitride, silicon oxynitride,
5 silicon oxide and photo resist, or combinations thereof;
- 6 patterning the photoresist mask to cover a corresponding pattern of the multiple
7 gate electrode; and
- 8 etching the gate electrode material that is uncovered by the photoresist mask to
9 form the discrete multiple gate electrode.
- 1 7. (Original) The method of claim 1, further comprising the steps of:
- 2 applying a photoresist mask of substantially uniform thickness on the planar top
3 surface of the planarized gate electrode material;
- 4 patterning the photoresist mask to cover a corresponding pattern of the multiple
5 gate electrode; and
- 6 plasma etching the gate electrode material that is uncovered by the photoresist
7 mask to form the patterned multiple gate electrode.

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- 1 8. (Original) The method as recited in claim 1, further comprising the step of:
2 applying a mask over the planarized surface, wherein the mask is of substantially
3 uniform thickness for accurate patterning thereof.
- 1 9. (Original) The method of claim 1 wherein, the gate dielectric comprises silicon
2 oxide.
- 1 10. (Original) The method of claim 1 wherein, the gate dielectric comprises silicon
2 oxynitride.
- 1 11. (Original) The method of claim 1 wherein, the gate dielectric comprises a high
2 permittivity material.
- 1 12. (Original) The method of claim 1 wherein, the gate dielectric comprises a material
2 having a permittivity greater than 5.
- 1 13. (Original) The method of claim 1 wherein, the gate dielectric comprises a
2 thickness in the range of 3 and 100 Angstroms.
- 1 14. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 polycrystalline silicon.
- 1 15. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 a conductive material.
- 1 16. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 a metal material.
- 1 17. (Currently Amended) A semiconductor device having a multiple gate electrode,
2 comprising:

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the semiconductor device having a projecting fin coated with a gate dielectric film over top and opposed sides of the fin;

a multiple gate electrode on each of the opposed sides of the fin, the multiple gate electrode formed of a layer of gate electrode material and having a substantially planar surface extending over the top disposed atop the gate dielectric film formed over the top of the fin and extending past each of the opposed sides of the fin; and

a patterned mask on the planar surface of the multiple gate electrode, the patterned mask having a substantially uniform thickness and a substantially planar surface.

18. (Previously Presented) The semiconductor device of claim 17 wherein, the multiple gate electrode is a portion of the layer of gate electrode material which has a planarized surface that includes the planar surface of the multiple gate electrode.

19. (Currently Amended) A method of making a multiple gate electrode on a semiconductor device, comprising:

providing a semiconductor device over a planar surface that extends from each of opposed sides of the semiconductor device;

coating a top and the opposed sides of the semiconductor device with a thin film gate dielectric;

coating a layer of gate electrode material over the semiconductor device and the planar surface; and

planarizing the layer of gate electrode material to produce a substantially planar surface formed only of the gate electrode material prior to patterning the gate electrode

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- 11 material to form a discrete multiple gate electrode on the semiconductor device, the
- 12 substantially planar surface disposed atop the semiconductor device.